

## JOINT FOR FLAT PARTS

## Technical field

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The invention relates to detachable joints for flat parts and can be used, in particular, for joining elements of building constructions, etc.

## Background art

10 A joint of "tongue-and-groove" type is known in the art, RU, C1, 2063158. Said construction is intended for joining the end surfaces of planks, which have longitudinal sides mated therebetween, with a transversal lath, wherein the joint between the planks and the joint between the planks and the lath are formed by complementary joggles and projections with shoulders, which are embodied in the 15 form of a dovetail, and the shoulders are slanted from the surface perpendicular to the base plane of the planks towards the edges of the projection and the joggle.

20 The disadvantages of said engineering solution are in that such joint allows joining only narrow planks with a lath; the jointing of wide plates is practically impossible, because it is very difficult to prevent the cramping of plates when overlapping them; also the joint is weak in bending because of the stress concentration that is produced in the bending points.

25 A joint for flat parts known in the art comprises mutually bonding complementary projections and sockets, embodied on the end surfaces of butt jointed parts and having the form of a dovetail, SU, A1, 1624218; longitudinal slits are embodied at the basis of each projection of one of the connecting parts; the 30 mating side surfaces of the projections and the sockets are embodied with alternating combination of the slope directions, wherein the facing side surfaces of two adjacent projections have the same direction of slope, end surfaces of the projections of one part have alternating direction of slopes and the end surfaces of the projections of the mating part are rounded.

Said joint can be used for connecting only elements having among them at least one element (part 1) made from an elastic and sufficiently flexible material

- such as rubber or soft plastics; this is required because during the assembly process the projections of part 1 have to be unbent and set into a position at a considerable angle to the part's surface; therefore, if both connecting parts are made from a rigid material, the joint thereof will be impossible, because in this joint the projections 4  
 5 have to move apart the projections 5; if the projections 3 are made from a rigid material, they will not unbend; if the projections 3 are made from a flexible but not elastic material, they will not return to the required position. Therefore, said assembly does not provide sufficient mechanical strength of the joint, because it is fundamentally unsuitable for the joining of rigid parts.
- 10 A joint for flat rigid parts known in the art comprises projections, which are embodied on the mating sides of the parts in the form of bulbous breadths at the edge thereof and necks at the basis thereof, and complementary joggles, which are embodied in the form of bulbous slots gradually changing into grooves corresponding to the projections necks; the surfaces of the projections edges and the  
 15 surfaces of the joggles bottoms mating therewith are embodied in the form of cylinders, US, C, 5588240.
- Said joint allow joining parts of all degrees of rigidness, including absolutely rigid parts, in particular, made from tough metals, minerals and similar materials.
- 20 This engineering solution is taken as a prototype of the present invention.
- Said engineering solution provides a reliable joining of parts when the joint works in tension. However, said solution is unsuitable when the joint works in bending or in shear in the direction which is perpendicular to the surface of the connecting parts. Therefore, in practice said joint is applied only in various games.

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#### Summary of the invention

- It is an object of this invention to provide a solution for developing a joint for flat rigid parts, which works in tension, in bending and in shear.
- According to the invention there is provided a joint for flat rigid parts, comprising projections, which are embodied on the mating sides of the parts in the  
 30 form of bulbous breadths at the edge thereof and necks at the basis thereof, and complementary joggles, which are embodied in the form of bulbous slots

corresponding to the bulbous breadths of the projections and gradually changing into grooves corresponding to the projections necks, and wherein the surfaces of the projections edges and of the slots bottoms mating therewith are embodied in the form of cones, and the peaks of the conical surfaces of the projections edges and of the slots bottoms are arranged on the opposite sides with respect to the connecting parts. The radius of curvature of the guiding lines of the conical surfaces of the projections edges and of the slots bottoms can be embodied in such a way that they tend to infinity; at least one connecting part can be embodied in the form of a through-thickness composite part.

10 The applicant hasn't found any source of information containing data on engineering solutions identical to the present invention. In applicant's opinion, this enables to conclude that the invention conforms to the criterion "Novelty" (N).

15 The novel features of the present invention provide an important technical effect produced by the inventive joint. The connecting flat parts effectively work not only in tension but also in bending (in one direction) and in shear in the direction which is perpendicular to the surface of the connecting parts. This enables the industrial application of the invention for reliable joining of elements of various constructions, including building constructions.

20 The applicant hasn't found any source of information containing data on the influence of the inventive novel features on the technical result produced through the realization of said features. In applicant's opinion, this enables to conclude that the present engineering solution conforms to the criterion "Inventive Step" (IS).

#### Brief description of the drawings

25 The invention is further illustrated, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a plan view of the invention as claimed in claim 1;

Figure 2 is a view of the part 1;

Figure 3 is a section of Figure 1 on the A-A line;

Figure 4 is a cross-sectional view of the invention as claimed in claim 3, where one of the connecting details is embodied in the form of a through-thickness composite part;

5       Figure 5 is a view of the invention as claimed in claim 2, where the radiiuses of curvature of the conical surfaces tend to infinity;

Figure 6 is a section of Figure 5 on the B-B line;

Figure 7 is a scheme illustrating the process of parts joining.

#### Preferred embodiment

10      The joint for flat parts 1 and 2 comprises projections, which are embodied on the mating sides of the parts in the form of bulbous breadths 3 at the edge thereof and necks 4 at the basis thereof, and complementary joggles, which are embodied in the form of bulbous slots 5 corresponding to the bulbous breadths 3 of the projections and gradually changing into grooves 6 corresponding to the projections 15     necks 4. The surfaces 7 of the projections edges and the surfaces 8 of the slots bottoms mating therewith are embodied in the form of cones. The guiding line 9 of the conical surface 7 passes through the peak 11, and the guiding line 10 of the conical surface 8 passes through the peak 12; the peaks 11 and 12 are arranged on the opposite sides with respect to the connecting parts.

20      Generally the radius of curvature R of the guiding lines of the conical surfaces 7 and 8 (the radius of curvature of the projection is equal to the radius of curvature of the slot within the accuracy of the value of the gap between the connecting parts 1 and 2) have limited values. In this case the guiding lines of the conical surfaces 7 and 8 have the shape of curved lines (see fig.1). However, if R tends to infinity, the shape of the guiding line of the conical surface tends to a 25     straight line (see fig.5).

At least one connecting part can be embodied in the form of a through-thickness composite part (see fig.4). In this case the part 2 consists of two pieces: upper piece 2a and lower piece 2b.

30      Parts 1 and 2 are joined in the following way. At first the parts are overlapped in such a way that their surfaces are positioned at an angle that is close

to a right angle (see fig.7), and the bulbous breadths 3 of the part 2 enter the bulbous slots 5 of the part 1; then the parts 1 and 2 are turned relative to each other, whereupon the breadths 3 are placed into the slots 5. Accordingly, the necks 4 of the projections of each part are placed into the grooves 6 of another part. The mutual  
5 rotation of the parts 1 and 2 is stopped when the conical surfaces 7 of the breadths 3 meet the conical surfaces 8 of the slots 5, wherein both parts will be located in the same plane. Thus, a uniform rigid plate is formed capable of working in tension-compression and in shear, virtually in the same way as a whole plate; the assembled construction works in bending in only one direction, namely when the bending  
10 moment has the same direction as the rotation of the plates during the assembly process. The disassembling of the construction is performed in reverse order.

#### Industrial applicability

Known simple industrial equipment and constructive materials common in  
15 the art are used for the production of the inventive device, which enables to conclude that the inventive device conforms to the criterion "Industrial Applicability" (IA).